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CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE

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Effects Of Ground Preparation On Planted Red Pine In Southwestern Wisconsin

ABSTRACT.—Red pine was planted in 1962 using five ground preparation methods and two classes of planting stock. After 9 years, 3-0 trees planted by a Lowther machine with scalpers and by hand in single plowed furrows had 37 percent more survival than trees hand planted in scalps. Planting method did not affect survival of 2-1 transplants. Height growth for both classes of stock was 18 percent greater for machine and single-furrow planted trees at 9 years than for trees hand planted in scalps. Survival and growth of trees hand planted in bench terraces and in double furrows were in between the values for the other methods.

OXFORD: 232.21:232.42:174.7(776) *Pinus resinosa*. KEY WORDS: stock, plantations, competition, survival, growth.

Red pine (*Pinus resinosa* Ait.) is the most commonly planted species on old fields in southwestern Wisconsin. Several ground preparation methods and kinds of stock are being evaluated on the Coulee Experimental Forest near La-Crosse, Wisconsin, in a study begun in 1962 to determine the best combination to use. Costs and first-year survival were reported by Stoeckeler.[1]

[1] *Stoeckeler, Joseph H. Ground preparation costs and first-year survival of planted red pine in southwestern Wisconsin. USDA Forest Serv. Res. Note LS-28, 4 p. Lake States Forest Exp. Sta., St. Paul, Minn. 1963.*

METHODS

The ground preparation methods being studied are (1) Lowther[2] planting machine with scalpers, (2) single furrow, (3) double furrow, (4) bench terrace, and (5) hand scalping. Planting for the last four was done by hand using a mattock and the center hole method. Both 3-0 seedlings and 2-1 transplants were tested; they were planted in the spring under ideal moisture conditions. Details of the methods and stock are available in an earlier report.[1] It was found that machine planting was the least expensive and that early survival rates were at least equal to those of other methods. Survival and height growth have been measured periodically since the plantation was established 9 years ago and some additional conclusions are now possible.

The plantation was established on an abandoned pasture having a 26- to 28-percent slope, a southerly exposure, and Hixton sandy loam soil. The slope was formerly forested but before planting supported a medium-density stand of young 1- to 3-foot-high sumac sprouts and a ground cover of bluegrass. Preliminary site preparation included cutting, piling, and burning the larger sumac and a controlled burn to eliminate the dried grass.

In all, 4,000 trees were planted in two treatment replications. All surviving trees were counted at ages 3 and 9 years, and heights were measured at ages 3, 6, and 9 years on 10 percent of the trees. The sampling was done systematically.

[2] *Mention of trade names does not constitute endorsement by the USDA Forest Service.*

RESULTS AND DISCUSSION

Seedling and transplant survival were the same when planting was done by machine or by hand in a single furrow (table 1). Ground preparation by double furrow, bench terraces, and scalping resulted in poorer seedling survival, but there were no differences in transplant survival. Eighty percent of all mortality occurred during the first 3 years.

Table 1.—Survival and height of red pine as affected by ground preparation and stock class

Ground preparation method and stock class	Survival rate		Average height		
	3 years	9 years	3 years	6 years	9 years
	Percent	Percent	Feet	Feet	Feet
Machine:					
3-0	87	82	2.4	7.0	12.6
2-1	91	84	2.5	7.5	12.8
Single furrow:					
3-0	84	79	2.7	6.9	12.1
2-1	92	83	2.7	7.2	12.5
Double furrow:					
3-0	71	68	2.2	6.1	11.3
2-1	80	77	2.2	6.1	11.6
Bench terrace:					
3-0	75	70	1.9	5.7	10.9
2-1	85	79	2.0	6.0	11.4
Scalping:					
3-0	64	60	1.8	5.0	10.8
2-1	81	81	2.1	5.6	10.9

Ground preparation method influenced height growth but stock class did not. Machine-planted trees grew fastest but were followed closely by hand-planted trees in single furrows. The poorest growth (nearly 2 feet less than machine-planted trees) occurred in the hand scalps. The differences in height associated with ground preparation methods remained fairly constant (about 2 feet between machine and hand scalping) from 6 to 9 years of age, indicating that the effect of ground preparation was not a continuing one.

In a similar study where red pine was hand planted on well drained sandy soils in central Wisconsin, Wilde and Albert[3] reported that survival and growth were better in the single furrows. Merz and Funk[4] did show that eastern white pine planted by machine in southeastern Ohio on silty clay loam to clay loam soils survived and grew as well, if not better, than hand-planted trees. They used various methods of ground preparation but found no significant benefit, attributing this to the scarcity of competition. Although machine versus hand planting was not adequately tested in our study, planting method did not seem as important as the way in which strongly competing vegetation was removed.

The failure of red pine transplants to show a definite advantage over seedlings when the machine and single-furrow methods were used should discourage the use of the more expensive transplants in this region. State tree nurseries in Wisconsin list 3-0 seedlings at $22 per 1,000 and 2-1 transplants at $42 per 1,000, and the decision whether to establish a plantation or not could well depend on this difference.

During this study, precipitation was only slightly less than normal and was evenly distributed throughout the growing season during the critical early years of the plantation. If a severe drought occurred during the first years after planting, transplants might provide some margin of safety.

In conclusion, nothing was gained by using red pine transplants instead of seedlings when competing vegetation was removed by scalpers on a machine or by plowing a single furrow and hand planting in the furrow. Although transplant survival was not affected by the ground preparation method, growth of both transplants and seedlings was. Trees planted with the machine grew best, but trees hand planted in a single furrow did nearly as well. Plowing a single furrow, bench terracing, and scalping all proved to be less beneficial. The machine and single-furrow methods were also the least expensive. The single-furrow method appears to be best for the landowner who has only a few acres to plant and can do the work himself. For larger operations, a tree planting machine with scalpers is the all-around best choice.

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[3] *Wilde, S. A., and Albert, A. R. Effects of planting methods on survival and growth of plantations on well-drained sandy soils of central Wisconsin. J. Forest. 65(9): 647-650. 1967.*

[4] *Merz, Robert W., and Funk, David T. Preplanting ground treatment tests for white pine in southeastern Ohio. USDA Forest Serv., Cent. States Forest Exp. Sta. Tech. Pap. 167, 8 p. 1959.*

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